What Is Claimed Is:

      1. A method for executing a nose reduction process in digital images, the method comprising:

5   detecting the edges contained in an image;

determining the orientation that is the direction in which the detected edges are formed; and

      applying a smoothing filter to the detected edges, wherein the smoothing filter has an extraction area in the same direction as the determined edge

10   orientation.

      2. A method according to Claim 1, wherein the smoothing filter has an extraction area that is wider in the direction parallel to the orientation of an edge than in the direction perpendicular to the orientation of the edge.

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      3. An method according to Claim 2, wherein the smoothing filter is a median filter.

      4. A method for executing a noise reduction process to images

20   composed of a plurality of pixels, the method comprising:

      finding the edge level in target pixels that are the object of the smoothing process;

      determining the edge angle that is the angle of an array of edge-forming pixels including the target pixels based on the calculated edge level;

25   obtaining a filter that has orientation properties extracting pixels in a given direction as reference pixels and matching the determined edge angle; and

      executing a first smoothing process on the target pixels using the filter that has been obtained.

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5. A method according to claim 4, wherein the filter has an extraction area which is wider in the parallel direction parallel than in the direction perpendicular to a given direction.

5   6. A method according to claim 5, wherein the filter is a median filter.

7. A method according to any of claim 6, further comprising:

calculating the dispersion value of the target pixels when the calculated edge level is lower than the prescribed edge level; and

10   executing a second smoothing process on the target pixels using a moving average filter having extraction areas that are smaller as the calculated dispersion value increases.

8. A method according to claim 7, further comprising:

15   separating the pixel values of the image by color difference components and brightness components,

wherein the edge level of the target pixels is calculated by calculating edge levels for the color difference and brightness components, and the edge level of the target pixels is the greatest edge level among the calculated edge

20   levels,

the dispersion value of the target pixels is calculated by calculating the dispersion values for the color difference and brightness components, and the dispersion value of the target pixels is the greatest dispersion value among the calculated dispersion values, and

25   the first and second smoothing process are only executed on the color difference components of the target pixels.

9. A method for executing a noise reduction process to images composed of a plurality of pixels, the method comprising:

finding the edge level in target pixels which are the object of the smoothing process;

calculating the gradient of the target pixels based on the calculated edge level;

5   obtaining a filter matching an edge angle on the image using the calculated gradient based on a predetermined relationship between the edge angles and the gradients, wherein the edge angle is an angle of an array of edge-forming pixels on the image, wherein the filter has orientation properties that extracts pixels oriented in the same angle direction as the edge angle; and

10   executing a first smoothing process on the target pixels using the filter that has been obtained.

10. A method according to claim 9, wherein the filter has an extraction area which is wider in the parallel direction parallel than in the direction

15   perpendicular to a given direction.

11. A method according to claim 10, wherein the filter is a median filter.

12. A method according to any of claim 11, further comprising:

20   calculating the dispersion value of the target pixels when the calculated edge level is lower than the prescribed edge level; and

executing a second smoothing process on the target pixels using a moving average filter having extraction areas that are smaller as the calculated dispersion value increases.

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13. A method according to claim 12, further comprising:

separating the pixel values of the image by color difference components and brightness components,

wherein the edge level of the target pixels is calculated by calculating

30   edge levels for the color difference and brightness components, and the edge

level of the target pixels is the greatest edge level among the calculated edge levels,

the dispersion value of the target pixels is calculated by calculating the dispersion values for the color difference and brightness components, and the

5   dispersion value of the target pixels is the greatest dispersion value among the calculated dispersion values, and

the first and second smoothing process are only executed on the color difference components of the target pixels.

10   14. An image processing apparatus for executing a noise reduction process to digital images, the image processing apparatus comprising:

edge detection logic for detecting edges contained in the images;
edge angle determination logic for determining the orientation of the detected edges; and

15   'smoothing logic for applying a smoothing filter to the detected edges, wherein the smoothing filter has an extraction area in the same direction as the determined orientation of detected edges.

15. An image processing apparatus for executing a noise reduction

20   process to images composed of a plurality of pixels, the image processing apparatus comprising:

edge level calculating logic for calculating the edge level in the target pixels that are the object of the smoothing process;

edge angle determination logic for determining the edge angle that is the

25   angle of an array of edge-forming pixels including the target pixels based on the calculated edge level;

memory logic for storing a plurality of filters in accordance with edge angles, wherein the each filter has orientation properties that extracts pixels in a given direction as reference pixels;

filter selection logic for selecting a filter with orientation properties matching the determined edge angle from the memory logic; and

smoothing logic for executing a smoothing process on the target pixels using the selected filter.

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16. An image processing apparatus for executing a noise-reduction process to images composed of a plurality of pixels, the image processing apparatus comprising:

edge level calculating logic for calculating the edge level in target pixels

10   that are the object of the smoothing process;

gradient calculating logic for calculating the gradient of the target pixels based on the calculated edge level;

memory logic for storing a plurality of filters associated with the gradient for a plurality of edge angles, wherein the each filter has orientation properties

15   that extracts pixels oriented in the same angle direction as the edge angle, which is the angle of an array of edge-forming pixels on the image;

filter selection logic for selecting a filter matching the edge angle on the image from the memory logic based on the calculated gradient; and

smoothing logic for executing a smoothing process on the target pixels

20   using the selected filter.

17. A computer readable medium that stores a program for executing a noise reduction process to digital images, said program being executed on a computer to implement:

25   a function for detecting edges contained in images;

a function for determining the orientation of detected edges; and

a function for applying a smoothing filter to the detected edge, wherein the smoothing filter has an extraction area in the same direction as the determined orientation of detected edges.

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18. A computer readable medium that stores a program for executing a noise reduction process to images composed of a plurality of pixels, said program being executed on a computer to implement:

a function for calculating the edge level in the target pixels that are the object of the smoothing process;

a function for determining the edge angle that is the angle of an array of edge-forming pixels including the target pixels based on the calculated edge level;

a function for obtaining a filter that has orientation properties extracted using pixels in a given direction as reference pixels and has orientation properties matching the determined edge angle; and

a function for executing a smoothing process on the target pixels using the filter that has been obtained.

19. A computer readable medium that stores a program for executing a noise reduction process to images composed of a plurality of pixels, said program being executed on a computer to implement:

a function for calculating the edge level in target pixels which are the object of the smoothing process;

a function for calculating the gradient of the target pixels based on the calculated edge level;

a function for obtaining a filter matching an edge angle on the image using the calculated gradient based on a predetermined relationship between the edge angles and the gradients, wherein the edge angle is an angle of an array of edge-forming pixels on the image, wherein the filter has orientation properties that extracts pixels oriented in the same angle direction as the edge angle; and

a function for executing a smoothing process on the target pixels using the filter that has been obtained.